must be prepared to do a certain amount of searching, unless he happens to remember the name of the discoverer. Still, the work will be found to be a very useful compilation, and it merits a place in the library of every technologist and man of science.

British Butterflies and other Insects. Edited by Edward Thomas. Pp. vii+127; illustrated. (London: Hodder and Stoughton, n.d.) Price 6*s*.

THIS is a pretty book, apparently intended rather as a gift-book or for the drawing-room table than for entomologists. Still, entomologists who wish for a little relaxation from their more arduous labours may take it up and find a series of chatty dissertations on various popular aspects of insect life by well-known writers. Anthony Collett writes on "Some English Butterflies," and G. A. B. Dewar on "The Bee Mind," "Ghost Moth Evenings," "The Railway Embankment," "Butterflies in Bed," "Pearl Skippers," "*Anax imperator*," and "The Sphinx Moth," while Richard South contributes "Field Notes on some English Butterflies," "Day-flying Moths," and "The Entomologist's Methods," and Alfred W. Rees and F. P. Smith, respectively, talk about "Humours of Insect Life in October" and "The Makers of Gossamer." There are about half a dozen coloured illustrations, each representing one or more insects on a flower; perhaps the best is the frontispiece, with two white admiral butterflies perched on honeysuckle, showing the upper and under surfaces of their wings; but why should the chapter on *Anax imperator* be illustrated by a rather clumsy figure of the female of *Libellula depressa*, which is not even mentioned?

A more serious discrepancy is the mention by different authors of two different butterflies under the name of the Large Heath, owing to some entomologists having been sufficiently ill-advised to transfer the name from *Epinephele tithonus* to *Coenonympha tiphon*.

The Oil and Bromoil Processes. By F. J. Mortimer and S. L. Coulthurst. Pp. 96. (London: Hazell, Watson and Viney, Ltd., 1909.) Price 1*s*. net.

THE "oil" process here referred to is a method of making photographic prints that has recently been much appreciated by those who desire to have the opportunity of altering the print during its production to suit their taste. It consists in exposing a bichromated gelatin film under the negative, washing it, and inking it up with a greasy ink. The application of the ink was originally done with a roller, but brushes are now generally used, as these permit of more control over the result. The "bromoil" process is exactly the same in its final stages, but starts with a bromide print, and as this may be an enlargement, there is no need for a full-sized negative. The authors are expert workers in these processes, and here give the results of their experience, with the most detailed instructions for every stage. The volume is issued as a practical guide, and as such is all that can be desired. We might, perhaps, point out the advantage of a little more knowledge of a fundamental or scientific kind to many of even the most able and experienced workers of photographic processes. The statement that dilute sulphuric acid should be freshly mixed, but cool, conveys the notion that the dilute acid changes to its detriment when kept for a few days. But a useless precaution such as this does no harm, and it is better for authors of practical instructions to include one meaningless precaution than to omit one that is essential.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Suggested Effect of High-tension Mains.

I SEE in certain American papers a statement that the high-tension mains which convey 14,000 horse-power from the Grand Rapids to Michigan are worked at a voltage of 110,000 over a distance of fifty miles, and it is suggested that both agricultural and other effects may be anticipated from the visible brush discharge from these elevated mains.

I suspect that the brush discharge is most marked in the immediate neighbourhood of the metallic poles or towers which support the insulators, and is weak in between. Nevertheless, some effect might be anticipated if the potential were continuous, or of one sign; but inasmuch as it is sure to be alternating, any expectation of an influence on crops or on fog is almost bound to be disappointed. A negative result is to be expected before hand.

OLIVER LODGE.

March 12.

Scientific Societies and the Admission of Women Fellows.

MR. ATKINSON'S letter under this heading in NATURE of February 25 reveals the fact that the majority of the fellows of the Geological Society, like the majority of the fellows of the Chemical Society, are desirous of following the example of the Linnean Society in admitting women to the fellowship of their respective societies. It is difficult to understand what valid reason the executives of these societies can urge for their continued opposition to the wishes of the greater number of their members. This is surely a matter in which the opinion of the majority should prevail, especially when that opinion in each case has been deliberately invited, presumably with a view to the settlement of the question.

In this connection I desire to direct attention to an utterance by the president of the Society of Public Analysts. In the course of his recent presidential address, Mr. Tatlock said:—"A little commotion has taken place lately on the question of the rights and privileges of women chemists, particularly as regards their admission to the membership of our societies, and a considerable variety of opinion has been expressed—one, I think, to the effect that if women were accorded all these, they might become formidable rivals in an already overcrowded profession. It appears to me that this amounts not only to a confession of weakness on the part of the 'party in power,' but that it is an unconscious admission that the claims of the ladies rest on a firm and solid foundation. It is not the first time, however, that men have been frightened by women. It appears to me that, having granted women the right to join our universities and educational institutions, to pay their fees, to compete with us, and, perchance, to beat us at examinations for diplomas, they are entitled to all the advantages which are, or ought to be, the natural consequences of their application and industry."

Mr. Tatlock thus voices, I believe, not only the general sentiment of the society which he represents, but of the Institute of Chemistry and of the Society of Chemical Industry in this country, and of a number of foreign chemical societies where no difficulty has been raised as to the admission of women. For the council of the London Chemical Society to continue to resist all attempts to admit women as fellows, in face of the declared opinion of the majority of the members that the time has arrived when they should be admitted, cannot, in my judgment, be justified on the ground either of justice or expediency.

I believe this question would be settled once and for all were the council to allow the society to exercise its discretion. They have only to permit the certificate of a woman chemist to go to the ballot in the usual way, and I, for one, would trust to the right feeling and good sense of the fellows to bring about her admission, if, as would be the case, her attainments justified her election. Any objec-

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tion that might be urged on the ground of the charter is wholly academic, for the society cheerfully admits, unmindful of the provisions of the charter, any alien who chooses to apply, and, as the recent ballot has proved, allows him to exercise the *de facto* rights and privileges of a corporator. A British-born woman may at least plead that she, at all events, is a "loving subject." The conflict of legal opinion has made it abundantly clear that there is no practical value in the doubt that has been raised as to the ineligibility of women, but there is absolutely no room for difference of opinion as to the ineligibility of the alien to act as a corporator. Why, then, should the British-born woman be excluded and the alien be admitted? If the alien may vote, why may not the British-born woman?

T. E. THORPE.

The Isothermal Layer of the Atmosphere.

THE point raised by Mr. R. F. Hughes in NATURE of January 21 and February 11 is one that appears to deserve consideration by the investigators of the upper air. He contends, I take it, that even if the instrument records perfectly the temperature of the metal strip, it does not necessarily tell us the temperature of the upper air, but the temperature which the strip takes up in order to bring about a balance between the heat received and lost by it; and in calculating this temperature it is unfair to neglect, without investigation, the absorption and emission of radiation by the instrument and the balloon.

If we take the case of the balloon, in a night ascent, we may write for the time variation of the temperature T of the gas in the balloon, assumed to be a sphere of radius r,

$$\frac{d\mathrm{T}}{dt} = -10^{-2}v + \frac{\mathrm{I}}{\mathrm{MC}} - \frac{4\pi r^2 f\rho v(\mathrm{T}-\theta)}{\mathrm{MC}} \qquad (1)$$

where v is the upward velocity of the balloon in metres per sec., M is the mass and C the mean specific heat of the balloon and its contents, θ the temperature and ρ the density of the outside air, and f a constant.

The first term represents the rate of decrease of temperature owing to expansion of the balloon.

The second term represents the rate of increase of temperature, assumed to take place uniformly through the balloon owing to the excess, I, of energy absorbed over energy radiated. In the lower layers I is almost certainly very small, and probably negative, but it may not be so at great altitudes.

The last term is an empirical formula to represent the rate of decrease of temperature owing to convection of heat from the balloon by the outside air.

If we assume the atmosphere to be transparent and the earth to be a perfect radiator, and write E for the intensity of its radiation per square centimetre, the balloon receives from the earth energy at the rate $2\pi r^2\mathrm{E}$, of which it absorbs, say, one-half, and transmits the remainder. (A very thin rubber membrane has been found to transmit 75 per cent. of low-temperature radiation.) At the same time, the balloon is radiating in all directions at a rate $\frac{1}{2}.4\pi r^2\mathrm{B}$ approximately, where B is the intensity of radiation of a perfect radiator at the balloon's temperature.

Thus $\mathrm{I}=\pi r^2[\mathrm{E}-2\mathrm{B}]$.

If the temperature of the earth is 280° A. (=7° C.), then E is about 0·55 gm. cal. per min., and is equal to 2B when the temperature of the balloon is 235° A. If the temperature of the balloon falls to 200° A., $\mathrm{B}=\frac{1}{4}\mathrm{E}$ nearly and $\mathrm{I}=\frac{1}{2}\pi r^2\mathrm{E}$.

I know of no measurements of the rate of convection from a rubber balloon, but a considerable number of experiments have been made to determine this rate for metallic thermometers. According to A. de Quervain (*Beiträge zur Physik der Freien Atmosphäre*, vol. i., p. 192), the value of $f\rho v$ for $v=5$ m.p.s, and $\rho=1{\cdot}2\times10^{-3}$ is roughly equal to 0·1 gm. cal. per min.

The equation (1) therefore reduces to

$$\frac{d\mathrm{T}}{dt} = -10^{-2}v + \frac{\pi r^2}{60\mathrm{MC}}\left[\mathrm{E}-2\mathrm{B}-0{\cdot}4\frac{\rho}{\rho_0}(\mathrm{T}-\theta)\right]$$

if $v=5$ m.p.s. and E, B are measured in gm. cal. per min.

Thus if $\rho=\frac{1}{3}\rho_0$ and $\mathrm{B}=\frac{1}{4}\mathrm{E}$, T must exceed θ by more than 2° C. if the effect of convection is to exceed that of radiation.

If we take the balloon to be initially of 100 cm. radius, and assume that the heat capacity of the envelope is one-half that of the hydrogen, we have for MC the value

$$1{\cdot}5\times3{\cdot}41\times\tfrac{4}{3}\pi.10^6.8{\cdot}8.10^{-5}=\pi\times600 \text{ nearly,}$$

the specific heat of hydrogen being 3·41.

Also r^2 will be 2×10^4, whence $\frac{\pi r^2}{\mathrm{MC}}=33$, and the first term is therefore comparable with the last two in the equation (1). If the temperature is diminishing at the rate of 6° C. per kilometre, T will diminish at the same rate if it exceeds θ by about 1°·7 C. Even if convection is only one-third as efficient as Quervain found, the temperature excess is not more than 5° C.

The thermometers are of bright metal, and even if they are directly exposed to the earth radiation they will not absorb at a rate as great as one-tenth of the rate we have assumed for rubber.

The equation for the temperature variation would be

$$\frac{d\mathrm{T}}{dt}=\frac{\mathrm{A}[\mathrm{E}-2\mathrm{B}]}{10\mathrm{MC}}-\frac{f\rho v.\mathrm{S}}{\mathrm{MC}}(\mathrm{T}-\theta), \qquad (2)$$

where S is the area exposed to the air current, and 2A the radiating area, which is certainly less than S for a tube thermometer.

If we take Quervain's figures we get A=80 cm.², and $\frac{f\rho v\mathrm{S}}{\mathrm{MC}}=8.\frac{\rho}{\rho_0}$ nearly, for a Hergesell instrument, while $\frac{\mathrm{A}}{\mathrm{MC}}=160$, so that for T=200° A. we have $\frac{d\mathrm{T}}{dt}=4{\cdot}4-2{\cdot}7\ (\mathrm{T}-\theta)$, and the excess of T over θ would be but slightly greater than 2° C.

We may, then, take it as certain that the temperatures recorded in night ascents can be but slightly affected by radiation so long as the upward velocity is as great as 5 m.p.s. The assumptions made as regards radiation and convection are, of course, only approximate, but I think they err on the side of exaggerating the radiation effect.

In conclusion, I may add that I undertook this calculation believing that it might be possible for radiation materially to affect the temperature, at least of the balloon, because I knew that even at night radiation from external sources was not insignificant. The result is, however, a complete justification of the instrumental records. The isothermal region exists, and it exists for the very reason which, in Mr. Hughes's opinion, renders useless the instrumental records—the necessity for the material air also to preserve a balance between heat received and heat lost by radiation.

E. GOLD.

Vienna, February 15.

The Promotion of Scientific Research.

PUBLIC attention was directed to the subject of scientific research by the proceedings at the annual meeting of the trustees of the Carnegie Trust, and especially by the prominence given to the promotion of original research in the speech of Mr. Balfour, reported in NATURE of March 4. The reports of the proceedings may have engendered in some minds exaggerated notions as to the extent to which philanthropic effort may succeed in solving the problem of providing incentives to original research. It will be as well, therefore, to mention, for the information of those who are unacquainted with the regulations under which monies subject to the trust may be applied in the promotion of original research, that the incomes of the beneficiaries under the trust are very limited, and the conditions which are specified in the scheme of the trustees are very restrictive. Mr. Balfour, though he spoke encouragingly of the methods adopted by the trustees, alluded to the difficulty and delicacy of the task of selecting people for original work, and to the "puzzling questions of administration" with which it is surrounded; and it seems impossible, without the aid of legislation, to devise any scheme for the application of monies to research purposes which will succeed in inspiring confidence in research workers and which will not greatly restrict the research work which it may be designed to encourage. Had inventors of patentable inventions been encumbered by conditions similar to those to which research workers who are the objects of private munificence are subjected, the progress of inven-

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